

$$A_p := 0.2 \quad P_{atm} := 1 \quad L := 0.04 \quad V := 2 \quad W_s := 0.300$$

$$O_{2o} := 21.0 \quad V_{m1} := 22.71 \quad K_{m1} := 7.63 \quad K_{i1} := 14.42 \quad P_{O_2} := 0.2$$

$$CO_{2o} := 0.03 \quad V_{m2} := 17.64 \quad K_{m2} := 5.08 \quad K_{i2} := 11.99 \quad P_{CO_2} := 0.2$$

Ode solver setup

$$oco_0 := \text{stack}(21.0, 0.03) \quad t_{min} := 0 \quad t_{max} := 80 \quad steps := 80$$

Ensure that rx is not assigned. $\text{Clear}(r1, r2) = 1$

$$dO(t, o) := \frac{1}{V} \cdot \left(\frac{A_p \cdot P_{O_2} \cdot P_{atm}}{L} \cdot (0.01 \cdot (O_{2o} - o)) - W_s \cdot r1 \right)$$

100 replaced with 1

$$dCO(t, co) := \frac{1}{V} \cdot \left(\frac{A_p \cdot P_{CO_2} \cdot P_{atm}}{L} \cdot (0.01 \cdot (CO_{2o} - co)) + W_s \cdot r2 \right)$$

$$r(O_{2i}, CO_{2i}, V_m, K_m, K_i) := V_m \cdot O_{2i} \cdot \left(K_m + \left(1 + \frac{CO_{2i}}{K_i} \right) \cdot O_{2i} \right)^{-1}$$

$$D(t, x, r(5)) := \begin{bmatrix} [O_{2i} \ CO_{2i}] := x^T \\ r1 := r(O_{2i}, CO_{2i}, V_{m1}, K_{m1}, K_{i1}) \\ r2 := r(O_{2i}, CO_{2i}, V_{m2}, K_{m2}, K_{i2}) \\ [dO(t, O_{2i}) \ dCO(t, CO_{2i})]^T \end{bmatrix}$$

$$oco := \text{rkfixed}(oco_0, t_{min}, t_{max}, steps, D(t, x, r(O_{2i}, CO_{2i}, V_m, K_m, K_i)))$$

$$O_{2i} := \text{augment}(\text{col}(oco, 1), \text{col}(oco, 2))$$

$$CO_{2i} := \text{augment}(\text{col}(oco, 1), \text{col}(oco, 3))$$

